

Borehole

**50-05-06****Log Event A****Borehole Information**

Farm : <u>T</u>	Tank : <u>T-105</u>	Site Number : <u>299-W10-113</u>
N-Coord : <u>43,502</u>	W-Coord : <u>75,742</u>	TOC Elevation : <u>671.61</u>
Water Level, ft : <u>0.3</u>	Date Drilled : <u>7/31/1973</u>	

**Casing Record**

Type : <u>Steel-welded</u>	Thickness, in. : <u>0.237</u>	ID, in. : <u>4</u>
Top Depth, ft. : <u>0</u>	Bottom Depth, ft. : <u>121</u>	
Type : <u>Steel-welded</u>	Thickness, in. : <u>0.280</u>	ID, in. : <u>6</u>
Top Depth, ft. : <u>0</u>	Bottom Depth, ft. : <u>121</u>	

Cement Bottom, ft. : 122      Cement Top, ft. : 0

**Borehole Notes:**

Borehole 50-05-06 was drilled in July 1973 to a depth of 87 ft. The borehole was drilled as part of the leak investigation for tank T-106. In May and June 1977, the borehole was extended to 121.5 ft. The 6-in. casing was perforated from 121 to 70 ft and 20 ft to the ground surface. A 4-in. casing was installed and the annular space was grouted.

The tops of both casings are approximately even with the ground surface. The tops of the casings, which are the zero reference for the SGLS, are at an elevation of 671.61 ft.

The casing wall thickness is assumed to be 0.237 in. for the 4-in. casing and 0.280 in. for the 6-in. casing. The thickness is based upon specifications for schedule-40, steel pipe, which was commonly used as casing at the Hanford Site in the 1970s.

**Equipment Information**

Logging System : <u>1B</u>	Detector Type : <u>HPGe</u>	Detector Efficiency: <u>35.0 %</u>
Calibration Date : <u>10/1997</u>	Calibration Reference : <u>GJO-HAN-14</u>	Logging Procedure : <u>MAC-VZCP 1.7.10-1</u>

**Logging Information**

Log Run Number : <u>1</u>	Log Run Date : <u>04/22/1998</u>	Logging Engineer: <u>Alan Pearson</u>
Start Depth, ft.: <u>0.0</u>	Counting Time, sec.: <u>200</u>	L/R : <u>L</u> Shield : <u>N</u>
Finish Depth, ft. : <u>5.0</u>	MSA Interval, ft. : <u>0.5</u>	Log Speed, ft/min.: <u>n/a</u>

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Log Run Number :	<u>2</u>	Log Run Date :	<u>04/23/1998</u>	Logging Engineer:	<u>Alan Pearson</u>
Start Depth, ft.:	<u>4.0</u>	Counting Time, sec.:	<u>200</u>	L/R : <u>L</u>	Shield : <u>N</u>
Finish Depth, ft. :	<u>55.0</u>	MSA Interval, ft. :	<u>0.5</u>	Log Speed, ft/min.:	<u>n/a</u>

Log Run Number :	<u>3</u>	Log Run Date :	<u>04/24/1998</u>	Logging Engineer:	<u>Alan Pearson</u>
Start Depth, ft.:	<u>54.0</u>	Counting Time, sec.:	<u>200</u>	L/R : <u>L</u>	Shield : <u>N</u>
Finish Depth, ft. :	<u>106.0</u>	MSA Interval, ft. :	<u>0.5</u>	Log Speed, ft/min.:	<u>n/a</u>

Log Run Number :	<u>4</u>	Log Run Date :	<u>04/27/1998</u>	Logging Engineer:	<u>Alan Pearson</u>
Start Depth, ft.:	<u>118.5</u>	Counting Time, sec.:	<u>200</u>	L/R : <u>L</u>	Shield : <u>N</u>
Finish Depth, ft. :	<u>105.0</u>	MSA Interval, ft. :	<u>0.5</u>	Log Speed, ft/min.:	<u>n/a</u>

Log Run Number :	<u>5</u>	Log Run Date :	<u>04/27/1998</u>	Logging Engineer:	<u>Alan Pearson</u>
Start Depth, ft.:	<u>75.0</u>	Counting Time, sec.:	<u>200</u>	L/R : <u>L</u>	Shield : <u>N</u>
Finish Depth, ft. :	<u>60.0</u>	MSA Interval, ft. :	<u>0.5</u>	Log Speed, ft/min.:	<u>n/a</u>

**Logging Operation Notes:**

The borehole was logged in four runs on April 22, 23, 24, and 27, 1998. The total depth of the borehole was measured at 118.9 ft. The total logging depth achieved by the SGLS was 118.5 ft. Spectra were collected at intervals of 0.5 ft. A 200-s count time was used on all log spectra. A repeat section was logged from 60 to 75 ft on April 27, 1998.

At the time of logging, the borehole was full of water. The depth to water inside the casing was measured at 0.3 ft.

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**Analysis Information**

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Analyst : R.G. McCainData Processing Reference : MAC-VZCP 1.7.9Analysis Date : 09/02/1998**Analysis Notes :**

The pre-survey and post-survey field verification measurements met acceptance criteria established for peak shape and system efficiency. Energy and resolution calibrations from appropriate verification spectra were used to establish the channel to energy conversion and peak resolution parameters used in processing the spectra acquired during the logging operation.

A casing correction factor for a 0.50-in.-thick steel casing was applied during analysis. This casing most closely matches the combined thickness of the 4-in. and 6-in. casings. Concentrations should be considered conservative, since there is no allowance for the effects of the annular grout between casings. Shape factor analysis was not performed because the effects of the dual casing and annular grout on the shape factors

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have not been quantified.

A comparison of the measured concentrations of man-made and naturally occurring radionuclides detected in the original and repeated logging runs indicates that the measurements generally repeat within two standard deviations (95-percent confidence level), indicating excellent repeatability.

**Log Plot Notes:**

Separate plots show the man-made and naturally occurring radionuclides. Concentrations are shown as apparent concentrations to reflect the uncertainty associated with the dual casing and annular grout. The headings of the plots identify the specific gamma lines used to calculate concentrations. Uncertainty bars in the plots show statistical uncertainties for the measurements as 95-percent confidence intervals. Open circles on the plot indicate the MDL, which represents the lowest concentration at which positive identification of a gamma ray peak is statistically defensible.

A combination plot includes man-made and natural radionuclides, the total gamma count rate derived from the spectral data, and the Tank Farms gross gamma log. The gross gamma log plot displays the latest available digital data. No attempt has been made to adjust the depths of the gross gamma logs to coincide with the SGLS data. The SGLS total gamma ray plot reflects changes in KUT concentrations detected throughout the logged interval.

The interval between 60 and 75 ft was relogged as an additional quality check and to demonstrate the repeatability of the radionuclide concentration measurements made by the SGLS. A comparison of the measured concentrations of the man-made and naturally occurring radionuclides using the data sets provided by the original and repeated logging runs is included. The measurements generally repeat within two standard deviations (95-percent confidence level), indicating excellent repeatability of the measured gamma-ray spectral peak intensities used to calculate the radionuclide assays.

A time-sequence plot of selected historical gross gamma log data from 1975 to 1994 and a plot showing the peak gross gamma activity recorded in the intervals from 60 to 70 ft and 70 to 80 ft between 1975 and 1995 are presented with the SGLS log plots.

**Results/Interpretations:**

The radionuclide concentrations identified in this borehole are underestimated and reported as apparent concentrations only.

Cs-137 contamination was detected from the ground surface to a depth of 37.5 ft. Apparent Cs-137 concentrations were approximately 16 and 11.4 pCi/g at depths of 7.5 and 11.5 ft, respectively. Below 15 ft, apparent Cs-137 concentrations were generally between 0.3 and 1 pCi/g.

Co-60 contamination was detected from 66 to 76 ft and at 81 and 83.5 ft. The maximum apparent concentration of 1.4 pCi/g was recorded at 66.5 ft. This concentration occurs at about the same depth as a gross gamma anomaly that has been observed in the historical gross gamma logs since at least 1974.

Apparent K-40 concentrations range between about 13 and 16 pCi/g from the ground surface to about 38 ft and then increase slightly to approximately 20 pCi/g. From 38 to 48 ft, the apparent K-40 concentrations remain at approximately 20 pCi/g. Between about 48 and 53 ft, K-40 concentrations drop to below 15 pCi/g. From 53 to 87 ft, the K-40 concentrations gradually increase to about 20 pCi/g. Below 101 ft, apparent K-40 concentrations decrease to approximately 5 pCi/g, and then gradually increase. Between 107 and 118 ft, apparent K-40 concentrations fluctuate between approximately 15 and 20 pCi/g.



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Apparent U-238 concentrations fluctuate between about 0.7 and 1.2 pCi/g over most of the borehole. A distinct increase in apparent U-238 concentrations occurs at 102 ft.

Th-232 concentrations generally fluctuate between 0.5 and 1.0 pCi/g from the ground surface to about 80 ft. Below 80 ft, apparent Th-232 concentrations range between 1.0 and 1.5 pCi/g.

Additional information and interpretations of log data are included in the main body of the Tank Summary Data Report for tank T-105.